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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/712,775	11/14/2003	Donggyun Han	2557-000216/US	7409

30593 7590 09/29/2005

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EXAMINER	
ALANKO, ANITA KAREN	

ART UNIT	PAPER NUMBER
1765	

DATE MAILED: 09/29/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/712,775	HAN ET AL.	
	Examiner	Art Unit	
	Anita K. Alanko	1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11/14/03; 9/22/05 election by telephone*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-50* is/are pending in the application.

4a) Of the above claim(s) *31-50* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-30* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

Election/Restrictions

Restriction to one of the following inventions is required under 35 U.S.C. 121:

I. Claims 1-30, drawn to a method, classified in class 216, subclass 41.

II. Claims 31-50, drawn to an apparatus, classified in class 156, subclass 345+.

The inventions are distinct, each from the other because of the following reasons:

Inventions I and II are related as process and apparatus for its practice. The inventions are distinct if it can be shown that either: (1) the process as claimed can be practiced by another materially different apparatus or by hand, or (2) the apparatus as claimed can be used to practice another and materially different process. (MPEP § 806.05(e)). In this case the apparatus can be used for removing materials other than photoresist such as non-photosensitive polymers.

Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

During a telephone conversation with John Castellano on September 22, 2005 a provisional election was made without traverse to prosecute the invention of Group I, claims 1-30. Affirmation of this election must be made by applicant in replying to this Office action. Claims 31-50 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the

application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

Drawings

Figures 2, 3A-3B, and possibly Figures 4 and 10 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). Corrected drawings in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-2, 4-9, 13-15, 19, 21-23, 29-30 are rejected under 35 U.S.C. 102(e) as being anticipated by Vaartstra (US 6,770,426).

Vaartstra discloses a method comprising:

treating the photoresist with a first reactant (supercritical carbon dioxide, col.5, lines 55-56) to cause swelling, cracking or delamination of the photoresist (since it is the same reactant as in the instant invention, the same results such as swelling are expected);

treating the photoresist with a second reactant (ozone, col.5, line 32) to chemically alter the photoresist (since it is the same reactant as in the instant invention, the same results such as chemically altering are expected); and

subsequently removing the chemically altered photoresist with a third reactant ("one or more additional components" col.5, lines 43-44, e.g., water, col.5, line 56).

As to claim 19, the steps are not limited to any specific order, therefore, as broadly cited, Vaartstra teaches all of the steps.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later

invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Vaartstra (US 6,770,426) in view of Liu and Shibata.

The discussion of Vaartstra from above is repeated here.

As to claim 3, Vaartstra does not disclose the dosage of the ion implantation. Liu and Shibata teach that ion implantation at the cited dosages are useful to enable the usage of thinner photoresists, which is useful for forming interconnections (see abstracts). It would have been obvious to use the cited dosage in the method of Vaartstra because Liu and Shibata teach that they are usful to enable the usage of thinner photoresists, which is useful for forming interconnections.

Claims 7-10, 24, 27 and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Vaartstra (US 6,770,426) in view of Tipton et al (US 6,800,142 B1) and Masuda et al (US 2004/0198627 A1).

The discussion of Vaartstra from above is repeated here.

As to claims 7-9, as broadly cited, Vaartstra discloses to use ozone vapor with the carbon dioxide at the cited temperatures and pressures. However, Tipton also teaches that it is useful to separate an ozone reactant (col.6, lines 3-4, col. 12, lines 9-10) from the supercritical carbon dioxide reactant (col.6, lines 3-5) enables the ozone reactant to be more concentrated, the supercritical fluid application to be more effective and increases the overall efficiency of the

process (col.1-15). It would have been obvious to one with ordinary skill in the art to separate the ozone and supercritical carbon dioxide fluids from one another and apply in separate steps in the method of Vaartstra because Tipton teaches that this enables the ozone reactant to be more concentrated, the supercritical fluid application to be more effective and increases the overall efficiency of the process.

Further, as to claims 9-10, it would have been obvious to one with ordinary skill in the art to use the cited temperatures, pressures and concentration because they determine how much active species are available for the reaction, and therefore they appear to reflect result-effective variables which can be optimized. See MPEP 2144.05 IIB.

Claims 11-12, 16-17 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Vaartstra (US 6,770,426) in view of Masuda et al (US 2004/0198627 A1).

The discussion of Vaartstra from above is repeated here.

As to claims 11-12, 16 and 28, Vaartstra does not disclose to rinse with deionized water. Masuda teaches that after a supercritical carbon dioxide process, that it is useful to rinse with water to remove residues (page 4, Table 5, Run 8). It would have been obvious to one with ordinary skill in the art to rinse with deionized water in the method of Vaartstra because Masuda teaches that this is useful after supercritical processes to remove residues, which increases the yield of the final product.

Claims 18, 20, 25-26 and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Vaartstra (US 6,770,426) in view of Tipton et al (US 6,800,142 B1) and Masuda et al (US 2004/0198627 A1).

The discussion of Vaartstra from above is repeated here.

As to claim 18, see the rejection of claim 9.

As to claim 20, the method of Vaartstra modified by Tipton uses different steps for the first reactant and the second reactant. It would have been obvious to do this in different chambers, with depressuraization and purging as cited, in the modified method of Vaartstra in order to enable each chamber to be optimized for each step.

As to claims 25-26, it would have been obvious to one with ordinary skill in the art to use the cited temperatures because the temperature determines how much active species are available for the reaction, and therefore it appears to reflect a result-effective variable which can be optimized. See MPEP 2144.05 IIB.

As to claim 30, since the method has the same steps as the instant invention, it is expected to have the same results of water solubility.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The cited art shows methods of removing photoresist with $SCCO_2$.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anita K. Alanko whose telephone number is 571-272-1458. The examiner can normally be reached on Mon-Fri until 2:30 pm (Wed until 11:30).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 571-272-1465. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Anita K. Alanko

Anita K Alanko
Primary Examiner
Art Unit 1765